इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 6471 (1971): Spectrometer (Student Type) [PGD 22: Educational Instruments and Equipment]

"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

BLANK PAGE

BRUTUM FULMEN
IGNORANTIA JURIS NON EXCUSAT
PROTECTED BY COPYRIGHT

IS : 6471 - 1971
(Reaffirmed 1998)

Indian Standard

SPECIFICATION FOR SPECTROMETER (STUDENT TYPE)

(Second Reprint FEBRUARY 2005)

UDC 535.853.225

© *Copyright* 1972

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 3 *June* 1972

AMENDMENT NO. 1 APRIL 1982

TO

IS:6471-1971 SPECIFICATION FOR SPECTROMETER (STUDENT TYPE)

Addendum

(*Page 4, clause 3.3.2*) – Add the following new entence at the end of the clause:

In the case of discs of sizes 125 and 150 mm, the ernier may read up to one minute if desired by the urchaser.

EDC 36)

Printed at : Sita Fine Arts (P) Ltd., New Delh

Indian Standard

SPECIFICATION FOR SPECTROMETER (STUDENT TYPE)

Optical and Mathematical Instruments Sectional Committee, EDC 36

Chairman

DR C. S. RAO

Kailas, Frenchpet, Masulipatam

Members	*Representing*
SHRI A. ALVARES	All India Instrument Manufacturers and Dealers, Association, Bombay
SHRI S. R. TALPADE (*Alternate*)	
SHRI A. N. BHATTACHARYA	Ministry of Defence (R & D)
SHRI J. CHATTERJEE	Survey of India, Dehra Dun
CHIEF HYDROGRAPHER (NAVY)	Naval Headquarters
DEPUTY DIRECTOR, STANDARDS (TRACK)	Research, Designs and Standards Organization (Ministry of Railways), Lucknow
ASSISTANT DIRECTOR, STANDARDS (TRACK) (*Alternate*)	
DIRECTOR, INSTRUMENTS RESEARCH & DEVELOPMENT ESTABLISHMENT	Ministry of Defence (R & D)
SHRI S. S. DHARMAYYA (*Alternate*)	
SHRI S. K. GAUTAM	Quality Marked Goods Manufacturers' Co-operative Association Ltd, Roorkee
SHRI P. L. BHARDWAJ (*Alternate*)	
SHRI A. GHOSH	National Test House, Calcutta
SHRI D. D. KHOSLA	Directorate of Industries, Government of Haryana, Chandigarh
SHRI V. KRISHNAMOORTHY	Directorate General of Technical Development, New Delhi
SHRI P. V. MAMMEN (*Alternate*)	
SHRI B. R. MANKHAND	The Koh-i-Noor (India) Private Ltd, Varanasi
LT-COL B. PAPANNA	Army Headquarters
SHRI PREM PRAKASH	National Physical Laboratory (CSIR), New Delhi
SHRI P. C. JAIN (*Alternate*)	
DR J. PRASAD	Central Scientific Instruments Organization (CSIR), Chandigarh
SHRI RAM SINGH (*Alternate*)	
SHRI S. RAGHVIAH	Office of the Development Commissioner, Small Scale Industries (Ministry of Industrial Development)

(*Continued on page* 2)

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

(*Continued from page* 1)

Members	*Representing*
Shri E. B. Rajderkar	Raj-Der-Kar & Co, Bombay
Kumari Subas Rajderkar (*Alternate*)	
Dr I. Ramakrishna Rao	In personal capacity (*Toshniwal Instruments and Engineering Co, 10A Najafgarh Road, New Delhi 15*)
Shri P. V. Subba Rao	The Andhra Scientific Co Ltd, Masulipatam
Col D. M. Samy	Ministry of Defence (DGI)
Shri S. K. Gupta (*Alternate*)	
Prof G. S. S. Sarma	Madras Institute of Technology, Madras
Lt-Col G. S. Sihota	Directorate General of Armed Forces Medical Service, Ministry of Defence
Surveyor of Works I [Office of the Superintending Surveyor of Works (NDZ)]	Central Public Works Department, New Delhi
Shri K. G. Torgal	The National Instruments and Ophthalmic Glass Ltd, Calcutta
Shri A. Ghosh (*Alternate*)	
Shri H. C. Verma	Associated Instrument Manufacturers ('India) Private Limited, New Delhi
Shri K. G. Purang (*Alternate*)	
Shri M. V. Patankar, Director (Mech Engg)	Director General, ISI (*Ex-officio Member*)

Secretary

Shri S. P. Abbey

Assistant Director (Mech Engg), ISI

Optical Instruments Subcommittee, EDC 36 : 2

Convener	
Shri A. N. Bhattacharya	Ministry of Defence (R & D)
Members	
Shri C. L. Batra	Towa Optics (India) Private Ltd, Delhi
Shri R. N. Bhargava	U. P. Optical Association, Agra
Shri N. R. Das Gupta	The National Instruments and Ophthalmic Glass Ltd, Calcutta
Shri N. R. Chakravarty (*Alternate*)	
Director, Instruments Research & Development Establishment	Ministry of Defence (R & D)
Shri R. C. Jain	Ministry of Defence (DGI)
Shri S. N. Das Gupta (*Alternate*)	

(*Continued on page* 11)

Indian Standard

SPECIFICATION FOR SPECTROMETER (STUDENT TYPE)

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 29 November 1971, after the draft finalized by the Optical and Mathematical Instruments Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 Spectrometer is a laboratory instrument with a collimator, telescope and a prism table, and is used for the study of spectrum produced by transmission of light through a prism or diffraction grating. Quantitatively it measures angles of deviation.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard specifies general and functional requirements of student type spectrometer.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions, in addition to those given in IS : 1399-1959† shall apply.

2.1 Base — The lowest part of the instrument provided with levelling screws and fixed pillar for collimator arm.

2.2 Outer Arm — The central part of the instrument mounted on taper-cone bearing and carrying circular scale and a pillar for telescope arm.

2.3 Turn Table — A rotating table consisting of a flat circular disc carrying two vernier scales, a tube fixed in the centre of the disc to hold the rod of the prism table and the prism table with its upright.

---

*Rules for rounding off numerical values (*revised*).

†Glossary of terms used in optical technology.

3. GENERAL REQUIREMENTS

3.0 The spectrometer shall conform to the requirements laid down in **4, 5** and **8** of IS : 988-1959* and to the general requirements laid down in **3** of IS : 2754-1964†.

3.1 Base — The base shall be of heavy construction for stability. It shall be provided with a clamping and a tangent screw for the slow movement of the turn table when the outer arm is fixed.

3.2 Outer Arm

3.2.1 The outer arm shall be pivoted on a taper-cone bearing in order to provide perfectly true co-axial movement in all positions.

3.2.2 The lower part of the outer arm shall be able to take up a pillar for mounting the telescope arm.

3.2.3 A disc of 125, 150, 175 or 225 mm diameter shall be rigidly fixed to the upper part of the outer arm for providing circular scale.

3.2.4 The disc shall be constructed of a suitable hard material like gun metal, phosphor bronze and stainless steel. It shall be engraved in degrees (0 to 360 degrees) in such a way that the direct reading up to at least 30 minutes may be taken. The scale shall be figured at each ten degrees. The accuracy of scale graduation shall be 5 seconds.

3.2.5 A clamping screw for fixing the outer centre and a tangent screw for the slow movement of the telescope, when it is fixed, shall be provided.

3.3 Turn Table

3.3.1 The cover plate shall be fitted in its lower part with two diametrically opposite verniers.

3.3.2 The vernier divisions shall be engraved on plates made of the same material as the disc of the scale in such a way that they may read up to 30 seconds.

3.3.3 The cover plate shall carry two transparent windows over verniers in order to facilitate taking readings and also to protect the scale and verniers from dust.

3.3.4 Two magnifiers, each having magnification of the order of 5×, shall preferably be provided in rotating frames over the windows.

3.3.5 The central shaft of the disc of the turn table shall be provided with a tube to hold the rod of the prism table. A locking screw with a knurled head shall be provided to fix the rod of the prism table within the tube. The prism table shall be capable of rotating independent of the verniers.

---

*General requirements for optical components.

†General requirements for optical instruments.

3.3.6 The prism table shall be provided with two parallel discs of diameter 50, 60, 75 or 100 mm and fitted with three spring loaded levelling screws. The upper surface of the prism table shall be engraved with concentric circles and straight lines parallel to the line joining two of the levelling screws in order to facilitate the correct settings of gratings and also of prisms with one of their faces parallel to the parallel lines. The centre line shall be clearly marked.

3.3.7 Suitable arrangements shall be made to hold prisms and gratings firmly on the prism table.

3.4 Collimator

3.4.1 The collimator arm shall be mounted on a sturdy pillar rigidly fixed to the base. The mounting shall be such that the collimator arm is capable of slightly rotating about a vertical axis and may be slightly tilted upwards and downwards.

3.4.2 The collimator arm shall be provided with a draw tube holding the slit and sliding into the main tube with the help of rack and pinion arrangement.

3.4.3 The slit shall be made of suitable hard material, like gun metal, phosphor bronze, and stainless steel, and the jaws shall be ground and finished with the utmost care. A mechanism shall be provided with a minimum closure stop to ensure that when these are fully closed they do not touch each other and damage the finely ground parallel jaws.

3.4.4 Suitable arrangement shall be made to increase or decrease the width and length of the slit. The maximum length and width of the slit shall be 15 and 2 mm respectively.

3.4.5 The fixed tube of the collimator arm shall take at its free end an achromatic objective of minimum focal length of 150 mm and minimum free aperture of 25 mm.

3.5 Telescope

3.5.1 The telescope arm shall be capable of rotating when mounted on a sturdy pillar rigidly fixed to the outer arm. The mounting shall be such that the telescope arm is capable of slightly rotating about a vertical axis and may be slightly tilted upwards and downwards.

3.5.2 The objective shall be achromatic and it shall have minimum focal length of 150 mm. The design of the collimator and the telescope shall be identical.

3.5.3 The telescope shall be provided with a Ramsden eyepiece of magnification not less than 10×.

3.5.4 Provision shall be made for fitting cross-wire or cross-line graticules with line thickness not exceeding 12 microns, at right angles, and also for the rack and pinion arrangement in order to focus the eyepiece.

3.6 Case — The case carrying the spectrometer shall be made of well-seasoned wood, such as teak; plywood or hardboard may also be used. It shall be suitably padded inside to eliminate the risk of shock during transportation. It shall be complete with lock and key arrangement with a suitable locking screw for securing the spectrometer and a cross piece to retain it in position during transit. The case shall be dust-proof and of a suitable design with a carrying handle at the top or one such handle on each of the two sides. It shall be provided with suitable internal receptacles for holding accessories. The case shall contain a cleaning brush and a bag of activated silica gel to keep the interior moisture free.

4. FUNCTIONAL REQUIREMENTS

4.1 The movement of the clamping, tangent, levelling and other adjusting screws and the motion of the different parts of the instrument, such as outer arm, turn table, eyepiece tube, slit holding tube and the magnifiers, shall be easy and smooth.

4.2 The mounting of the collimator and the swinging telescope arms shall be such that the rotatory movement of the collimator arm and the upwards and downwards movements of both the arms are easy and smooth.

4.3 The prism table shall not fall due to its own weight when clamped at any desired height. When not clamped, the rod of the prism table shall move up and down and rotate smoothly inside the tubular opening provided for.

4.4 The clamping screws shall be such that they do not exert any strain on the clamped parts.

4.5 The movement of the jaws shall be smooth and shall remain parallel at all the openings. The length altering arrangement of the slit shall have smooth operation.

4.6 The telescope and collimator arms shall be mounted on pillars in such a way that their optical axes are in the same straight lines and at the same time intersect at right angles to the vertical axis of the instrument passing through the centre of the circular scale.

4.7 The vertical axis of the prism table shall pass through the centre of its discs as well as through the centre of the circular scale so that it may coincide with the vertical axis of the instrument.

5. TESTS

5.1 General Requirement Tests

5.1.1 *External* — The instrument shall initially be checked for the following external defects:

a) Loose, missing or damaged screws, nuts and other small parts;

b) Damage to telescope, collimator, scale, turn table, knobs, etc; and

c) Damage to engraving and external finish.

5.1.2 *Internal* — The instrument shall be checked for the following internal defects:

a) Scratched, chipped or dirty optics;

b) Damage to optical parts, graticule and deterioration of optical cement and anti-reflection coatings;

c) Filming or fungus growth on the optical surfaces, etc;

d) Bubbles, striae and greyness, cloudiness or milky appearance on lenses;

e) Lack of sharpness and clarity of the graticule and any dust or dirt in the field of view; and

f) Any stray light from the interior surfaces affecting the vision.

5.1.3 The instrument shall be checked for the smooth and adequate movement of the following part:

a) Turn table,

b) Outer arm,

c) Telescope,

d) Collimator, and

e) Tangent, clamping and levelling screws.

5.2 Performance Tests

5.2.1 *Mechanical*

5.2.1.1 *Consistency of reading* — The spectrometer shall be set up at a particular position and the cross wire of the telescope shall be coincided with one of the edges of the image of slit. The reading on the circular scale shall be taken. After disturbing the set up, the telescope cross wire shall again be coincided with the same edge of the slit's image and the circular scale reading shall be noted. The difference between the two readings shall not be more than 30 seconds.

5.2.1.2 *Accuracy of circular scale* — A separate collimator with slit shall be used for this purpose and the telescope shall be focused to see the image of the slit. The width of the slit image shall be measured at various positions of the scale by changing the position of the telescope and collimator. The difference among various readings shall not be more than 30 seconds.

5.2.1.3 *Free aperture* — The free aperture of the object glasses of telescope and collimator shall be measured by means of a slide gauge. The measured values shall conform to the specified values.

5.2.2 *Optical*

5.2.2.1 *Verticality of slit graticule* — The verticality of the telescope graticule shall be tested with the help of a plumb line. The verticality of the slit of the collimator shall then be adjusted to coincide with the vertical line of the telescope graticule.

5.2.2.2 *Definition* — The definition of the telescope shall be tested with the help of a definition board given in Appendix E of IS:2754-1964*. The circles, lines and squares of the board shall appear sharply defined without any distortion and colour over at least two thirds of the field. The definition and freedom from colour and distortion over the remainder of the field shall also be reasonably satisfactory.

5.2.2.3 *Magnification* — The magnification of the telescope shall be tested by the method specified in Appendix C of IS:2754-1964*. The measured value shall not differ by more than 5 percent from the specified value.

5.2.2.4 *Resolving power* — The resolving power of the telescope shall be measured by the method specified in Appendix F of IS:2754-1964*. The measured value shall not differ by more than 5 percent from the theoretical value.

5.2.2.5 *Parallax* — The telescope shall be tested for parallax with the aid of a collimator. When the collimator is focused, there shall not be any apparent movement between the image of the collimator slit and the telescope graticule when the collimator slit is observed through telescope eyepiece and the eye is moved in the rear of the eyepiece at right angles to its axis.

5.2.2.6 *Collimation* — The collimator axis shall coincide with the optical axis of the telescope. This shall be tested as follows:

a) The prism table shall be set by means of a circular spirit bubble. The bubble shall remain stationary when the prism table is rotated.

---

*General requirements for optical instruments.

b) The slit shall be adjusted for its smallest length and an optical square shall be placed on the prism table. The image of the slit, when seen directly and also when deviated 90° by the optical square on either side, shall remain reasonably symmetrical with respect to the horizontal line of the telescope graticule.

5.2.2.7 *Coincidence of telescope and collimator axis and vertical axis of prism table* — The axis of the telescope and the collimator shall intersect the principal vertical axis of the instrument, that is, the common axis of rotation of the prism table and the telescope. The following set up shall be used:

An illuminating device (autocollimation ocular) shall be attached to the telescope and a ground glass plate or translucent paper shall be set up on the prism table at right angles with the emergent light bundle. The image formed on the plate shall be viewed from behind. The plate shall be provided with a horizontal scale and adjusted laterally in such a way that the mid point of the scale is located exactly above the centre mark of the prism table. It shall be assured that the illuminated circle on the plate is exactly symmetrical with regard to the scale within the range of lateral adjustment of the telescope. The prism table shall then be turned through 180° and the test shall be repeated with the collimator by using its slit or an autocollimation ocular. The axis of the telescope and the collimator shall be perpendicular to the principal axis of the instrument. This shall be tested as follows:

a) An optically plane parallel glass plate (preferably both sides mirrored) shall be placed vertically on the prism table. The reflected image of the telescope reticule from the glass plate shall be observed in the telescope with autocollimation ocular. The prism table shall be levelled and adjusted by rotating it so that the reflected image of the reticule coincides with the reticule itself. Then the prism table shall be turned through 180°, the image shall coincide with the reticule again.

b) The slit of the collimator shall be adjusted for its smallest length. The image of the slit when seen through the telescope shall be reasonably symmetrical with respect to the horizontal line of the telescope graticule.

5.3 Optional Tests — When agreed upon between the manufacturer and the purchaser the following tests may be conducted.

5.3.1 *Vibration Test* — The spectrometer, in its fully assembled condition and placed in its case, shall be clamped on to a vibrating table giving approximately 450 vibrations per minute with a maximum amplitude of 1·5 mm for a period of five minutes. After the test, the performance of the spectrometer shall remain unimpaired.

5.3.2 *Bump and Shock Test* — The test shall be carried out as specified in IS : 2352-1963*.

6. MARKING

6.1 The spectrometer shall be marked at a suitable place with the manufacturer's name or trade-mark and the year of manufacture.

6.1.1 **The product may also be marked with Standard mark.**

6.1.2 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

7. PACKING AND PACKAGING

7.1 The spectrometer shall be delivered in a thoroughly clean and dry condition, free from all traces of foreign material.

7.2 The telescope arm shall be brought near the collimator arm so that both are parallel to each other. The prism table shall be brought to its lowest position and shall be well-tightened in the tube holding it.

7.3 The spectrometer shall then be placed in its case and held in position securely.

7.4 A bag containing requisite amount of activated silica gel shall be placed inside the case.

7.5 The empty spaces, if any, shall be filled with suitable size bags stuffed with dried cotton.

7.6 The case with its contents shall be locked during transit and the keys attached to one of the handles.

7.7 The case shall then be packed in a packing box lined with waterproof paper, using dried cotton waste as cushioning material. The lid shall be screwed down.

7.8 The package shall be marked with the description, number of contents, the standard symbol for indicating fragile contents, the symbol 'THIS WAY UP' and the legend 'INSTRUMENT, HANDLE WITH CARE' in red according to IS : 1286-1967†.

---

*Procedure for basic climatic and durability tests for optical instruments.

†Pictorial markings for handling of goods in general (*first revision*).

(*Continued from page* 2)

Members	*Representing*
Shri V. Krishnamoorthy	Directorate General of Technical Development, New Delhi
Shri S. K. Maheshwari	Government Precision Instruments Factory, Lucknow
Shri P. C. Midha	Small Industries Service Institute, Kanpur
Shri D. R. Goyal (*Alternate*)	
Dr M. V. R. K. Murty	Department of Atomic Energy, Bombay
Lt-Col B. Papanna	Army Headquarters
Dr J. Prasad	Central Scientific Instruments Organization (CSIR), Chandigarh
Shri J. L. Mathur (*Alternate*)	
Shri Ram Prashad	National Physical Laboratory (CSIR), New Delhi
Shri S. V. Gupta (*Alternate*)	
Prof V. Ramakrishna Rao	In personal capacity (*J. V. D. College of Science & Technology, Andhra University, Waltair*)
Shri P. V. Subba Rao	The Andhra Scientific Co Ltd, Masulipatam
Shri S. K. Roy	Directorate General, Ordnance Factories (Ministry of Defence)
Shri V. K. Varshneya	Central Scientific Instrument Corporation, Agra

BUREAU OF INDIAN STANDARDS

Headquarters
Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002
Telephones 23230131, 23233375 23239402 **Fax** 91+011 23239399, 23239382
E - Mail info@bis org in website http //www bis org in

Central Laboratory:	***Telephone***
Plot No 20/9, Site IV, Sahibabad Industrial Area, SAHIBABAD 201010	277 0032

Regional Offices	
Central Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	2323 7617
*Eastern 1/14 CIT Scheme VII M, V I P Road, Kankurgachi, KOLKATA 700054	2337 8662
Northern SCO 335-336, Sector 34-A, CHANDIGARH 160022	260 3843
Southern C I T Campus, IV Cross Road, CHENNAI 600113	2254 1984
Western Manakalaya, E9, MIDC, Behind Marol Telephone Exchange, Andheri (East), MUMBAI 400093	2832 9295

Branch Offices	
Pushpak' Nurmohamed Shaikh Marg, Khanpur, AHMEDABAD 380001	560 1348
Peenya Industrial Area, 1st Stage, Bangalore-Tumkur Road, BANGALORE	839 4955
Commercial cum-Office Complex, Opp Dushera Maidan, E-5 Arera Colony, Bittan Market, BHOPAL 462016	242 3452
62 63, Ganga Nagar, Unit VI, BHUBANESHWAR 751001	240 3139
5th Floor, Kovai Towers, 44 Bala Sundaram Road, COIMBATORE 641018	221 0141
SCO 21, Sector 12, Faridabad 121007	229 2175
Savitri Complex, 116 G T Road, GHAZIABAD 201001	286 1498
53/5 Ward No 29, R G Barua Road, 5th By lane, Apurba Sinha Path, GUWAHATI 781003	245 6508
5-8 56C, L N Gupta Marg, Nampally Station Road, HYDERABAD 500001	2320 1084
E-52, Chitaranjan Marg, C-Scheme, JAIPUR 302001	237 3879
117/418 B, Sarvodaya Nagar, KANPUR 208005	223 3012
Sethi Bhawan, 2nd Floor, Behind Leela Cinema, Naval Kishore Road, LUCKNOW 226001	261 8923
NIT Building, Second Floor, Gokulpat Market, NAGPUR 440010	252 5171
Mahabir Bhavan, 1st Floor, Ropar Road, NALAGARH 174101	22 1451
Plot No A-20-21, Institutional Area, Sector 62, Goutam Budh Nagar, NOIDA-201307	240 2206
Patliputra Industrial Estate, PATNA 800013	226 2808
First Floor, Plot Nos 657-660, Market Yard, Gultkdi, PUNE 411037	426 8659
"Sahajanand House" 3rd Floor, Bhaktinagar Circle, 80 Feet Road, RAJKOT 360002	237 8251
T C No 14/1421, University PO Palayam, THIRUVANANTHAPURAM 695034	233 9174
1st Floor, Udyog Bhavan, VUDA, Siripuram Junction, VISHAKHAPATNAM-03	271 2833

---

*Sales Office is at 5 Chowringhee Approach, P O Princep Street, KOLKATA 700072	2355 3243
*Sales Office is at Novelty Chambers, Grant Road, MUMBAI 400007	2309 6528

Printed at **Sita Fine Arts (P) Ltd ,**